

# **Appendix A**

## **Public Education Database**



**Table A-1 Public Education Database**

Name or Title of Meeting / Presentation	Date of Presentation /Meeting	Name of Presenter	No. of Attendees	Region							Audience										Material Presented								
				Bay	University	Grand	Metro	North	Southwest	Superior	Permits	Executives	Design Staff	Construction Staff	O&M Staff	Planning & Develop. Staff	Contractors - Construction	Contractors – Engineers & Traffic	Government	General Public	TT Employees or Road Crew	Unknown MDOT Department	Overview of Permit	Public Education	Public Involvement/ Participation	Illicit Discharge Elimination	Post Construction SWP	Construction Storm Water Runoff Control	Pollution Prevention
Design Support Area Staff-Module #1	11/5/2002	Croskey	10		X							X										X	X		X			X	
Region Project Prioritization Team	11/19/2002	Mathies	13						X						X		X					X	X		X			X	
Utility Conference Test Module 1&4	11/26/2002	Croskey	4															X	X		X	X		X			X		
Utility Co-ordination & Permits Conference	12/10/2002	Croskey	71	X	X	X	X	X	X	X	X												X		X			X	
Utility Co-ordination & Permits Conference	12/11/2002	Croskey	68	X	X	X	X	X	X	X	X												X		X			X	

Name or Title of Meeting / Presentation	Date of Presentation /Meeting	Name of Presenter	No. of Attendees	Region							Audience												Material Presented							
				Bay	University	Grand	Metro	North	Southwest	Superior	Permits	Executives	Design Staff	Construction Staff	O&M Staff	Planning & Develop. Staff	Contractors - Construction	Contractors – Engineers & Traffic	Government	General Public	TT Employees or Road Crew	Unknown MDOT Department	Overview of Permit	Public Education	Public Involvement/ Participation	Illicit Discharge Elimination	Post Construction SWP	Construction Storm Water Runoff Control	Pollution Prevention	Soil Erosion
Storm Water Internal Training	12/16 /2002	Mathies	9						X			X	X	X								X	X		X	X	X	X		
Storm Water Internal Training	1/15/ 2003	Mathies	15						X		X	X				X					X	X		X	X	X	X			
Construc- tion Site Certified SW Operator	1/16/ 2003	Noble	14	X								X	X												X	X				
Soil Control & Sediment Control	3/4/ 2003	Killings- worth	17	X								X	X	X															X	
Soil Control & Sediment Control	3/5/ 2003	Killings- worth	13					X			X	X	X																X	
Soil Control & Sediment Control	3/5/ 2003	Killings- worth	16					X			X	X	X	X		X													X	
Soil Control & Sediment Control	3/6/ 2003	Killings- worth	18					X			X	X		X		X													X	

Name or Title of Meeting / Presentation	Date of Presentation /Meeting	Name of Presenter	No. of Attendees	Region							Audience												Material Presented							
				Bay	University	Grand	Metro	North	Southwest	Superior	Permits	Executives	Design Staff	Construction Staff	O&M Staff	Planning & Develop. Staff	Contractors - Construction	Contractors – Engineers & Traffic	Government	General Public	TT Employees or Road Crew	Unknown MDOT Department	Overview of Permit	Public Education	Public Involvement/ Participation	Illicit Discharge Elimination	Post Construction SWP	Construction Storm Water Runoff Control	Pollution Prevention	Soil Erosion
Soil Control & Sediment Control	3/6/ 2003	Killingsworth	10					X					X	X		X														X
Soil Control & Sediment Control	3/7/ 2003	Killingsworth	20			X							X	X																X
Soil Control & Sediment Control	3/10/ 2003	Killingsworth	6	X									X	X																X
Soil Control & Sediment Control	3/10/ 2003	Killingsworth	19	X									X	X																X
Soil Control & Sediment Control	3/25/ 2003	Killingsworth	16				X						X	X																X
Soil Control & Sediment Control	3/25/ 2003	Killingsworth	12				X						X	X																X
Soil Control & Sediment Control	3/28/ 2003	Killingsworth	18			X	X						X	X																X
Soil Control & Sediment Control	4/17/ 2003	Killingsworth	11		X								X	X																X

Name or Title of Meeting / Presentation	Date of Presentation /Meeting	Name of Presenter	No. of Attendees	Region							Audience											Material Presented								
				Bay	University	Grand	Metro	North	Southwest	Superior	Permits	Executives	Design Staff	Construction Staff	O&M Staff	Planning & Develop. Staff	Contractors - Construction	Contractors – Engineers & Traffic	Government	General Public	TT Employees or Road Crew	Unknown MDOT Department	Overview of Permit	Public Education	Public Involvement/ Participation	Illicit Discharge Elimination	Post Construction SWP	Construction Storm Water Runoff Control	Pollution Prevention	Soil Erosion
SW Pre-sentation Module 1	4/22/ 2003	Neiss	57					X						X						X		X	X		X			X		
Soil Control & Sediment Control	4/28/ 2003	Killings-worth	16						X			X	X																X	
Soil Control & Sediment Control	5/2/2 003	Killings-worth	14						X			X	X																X	
Soil Control & Sediment Control	5/5/2 003	Killings-worth / Heme	17		X							X	X																X	
Soil Control & Sediment Control	6/9/2 003	Killings-worth	20						X			X	X																X	
Total			504	6	5	4	5	7	8	2	6	1	19	19	6	4	0	4	1	1	0	1	6	8	0	8	3	3	8	16

**Table A-2 Public Education Campaign and Conferences**

<b>Name or Title of Meeting/Presentation</b>	<b>Date of Presentation /Meeting</b>	<b>Name of Presenter</b>	<b># of MDOT Attendees</b>	<b>Other Attendees</b>
Participation Statewide Education Campaign	4/9/2003	Seth Phillips, Mike O'Malley	2	15
Participation Statewide Education Campaign	5/7/2003	Seth Phillips	1	15
Drain Code Work Group	6/19/2003	Gary Croskey	1	29
<b>Total</b>			<b>4</b>	<b>59</b>





## **Appendix B**

# **Watershed and Local Stream Organizations**



**River/Watershed Groups with Interest in Phase I Communities  
Ann Arbor, Flint, Grand Rapids, Sterling Heights, Warren**

**Clinton River**

Clinton River Watershed Council  
Jessica Pitelka Opfer, Executive Director  
Heather Van Den Berg, Education Director  
101 Main Street, Suite 100  
Rochester Hills, MI 48307  
(248) 601-0606  
(248) 601-1280 fax  
jessica@crwc.org  
heather@crwc.org  
<http://www.crwc.org>

Clinton River RAP  
William Smith  
49 Breitmeyer  
Mt. Clemens, MI 48043  
(810) 468-4028

**Flint River**

Flint River Watershed Coalition  
Glenn Lefeber, Executive Director  
Dorothy Gonzales, Public Relations Chair  
Center for Applied Environmental Research  
432 N. Saginaw Street  
Suite 805  
Flint, MI 48502  
(810) 257-3190 or (810) 767-6490  
(810) 257-3810 fax  
dgonzale@co.genesee.mi.us  
<http://www.flintriver.org>

Partnership for the Saginaw Bay Watershed  
William Wright  
c/o Saginaw County Planning  
400 Court Street  
Saginaw, MI 48602  
(517) 797-6800  
(517) 797-6947 fax

Saginaw River/Bay RAP  
Dennis Zimmerman  
716 E. Forest Blvd.  
P.O. Box 325  
Lake George, MI  
(517) 588-9343  
(517) 588-2574 fax

The WETNET Project  
Goodrich Middle/High Schools  
8029 S. Gale Road  
Goodrich, MI 48438  
(810) 636-2550  
(810) 636-2253 fax  
twheatle@genesee.freenet.org

**Grand River**

Robert B. Annis Water Resources Institute  
Grand Valley State University  
One Campus Drive  
Allendale, MI 49401  
(616) 895-3749

Bear Creek Watershed Project  
Barbara Scott  
Robert B. Annis Water Resources Institute  
Grand Valley State University  
One Campus Drive  
Allendale, MI 49401  
(616) 895-3789

West Michigan Environmental Action  
Council  
1514 Wealthy SE  
Grand Rapids, MI 49506  
(616) 451-3051  
info@wmeac.org  
<http://www.wmeac.org>

York Creek  
Frank Walsh  
Robert B. Annis Water Resources Institute  
Grand Valley State University  
One Campus Drive  
Allendale, MI 49401  
(616) 895-3722

### **Huron River**

Huron River Watershed Council  
Laura Rubin, Executive Director  
1100 N. Main Street  
Suite 210  
Ann Arbor, MI 48104  
(734) 769-5123  
(734) 998-0163 fax  
lrubin@hrwc.org  
<http://comnet.org/hrwc/>

Allens Creek Watershed Group  
Rita or Vince Caruso  
(734) 668-0497

Fleming Creek Advisory Council  
Meroe Kericher  
(734) 459-5386

Malletts Creek Association  
Jesse Gordon  
(734) 971-9018

Michigan Natural Areas Council  
Teresa Chase  
Sylvia M. Taylor, Ph.D.  
c/o Matthaei Botanical Gardens  
1800 N. Dixboro Road  
Ann Arbor, MI 48109-9741  
(734) 461-9390  
mnac@cyberspace.org

## **Appendix C**

**Excerpt from MDOT Drainage Manual**  
**(Chapter 9 Stormwater BMPs – Page 9-13**  
**through 9-34 )**



## 9.4.2 MDOT-Approved BMPs

The following two sections describe MDOT-approved BMPs. Section 9.4.2.1 lists approved BMPs in a table format, and Section 9.4.2.2 lists the BMPs in alphabetical order along with their definition and applications.

### 6.4.2.1 Summary List for BMP Selection

Table 9-1 gives an alphabetized listing of BMPs, which can be used on MDOT projects. These BMPs are taken from the *SESC Manual* and the MDOT SWMP. BMPs which need more explanation than is provided in the *SESC Manual* are discussed in Section 9.4.2.2; otherwise, for design details, see the references given in Table 9-1. Copies of details identified can be found in the *SESC Manual*. Estimated costs are provided in Appendix 9-B.

When selecting BMPs, use those given in Table 9-1. Additionally, there are some BMPs selection guidelines, listed below, which should always be used to help accomplish MDOT goals.

1. Preserve the natural drainage system.
2. Control source pollutants by:
  - Maximizing green space.
  - Protecting riparian buffer.
  - Stabilizing disturbed areas.
  - Identifying proper use of fertilizers and pesticides.
  - Identifying proper use of snow and ice control operations.
3. Evaluate site according to project delivery steps outlined in Section 9.4.1.2.
4. Use SESC details, outlined in the *SESC Manual*, for evaluation during construction.
5. Prepare a plan for proper operation, inspection, and maintenance to keep BMPs working as intended. A proper plan may include the following items:
  - Schedule for maintenance.
  - Necessary actions.
  - Responsibility chart for actions.
  - Equipment required.
  - Cost opinions.

**Table 9-1 List of MDOT-Approved BMPs**

BMP Name	SESC Plan No.	References	Typical Use	Duration		BMP Type		
				Temporary	Permanent	Vegetative	Operational	Structural
Aggregate Cover	E&S-8	SESC Manual	Stabilize area for construction operations	X	X			X
Benches	E&S-9	SESC Manual	Reduce runoff velocity	X	X			X
BMP Inspection and Maintenance Plan		SWMP	Necessary maintenance to keep BMPs working correctly		X		X	
Check Dam	E&S-37	SESC Manual	Reduce erosive velocities in ditches	X				X
Clean and Maintain Storm Drain Ditches		Chapter 4 and O&M Handbook	Remove contaminated sediments	X	X		X	
Clean and Maintain Storm Inlet and Catch Basins		Chapter 7 and O&M Handbook	Remove contaminated sediments	X	X		X	
Cofferdam	E&S-34	SESC Manual	Isolate dry work area	X				X
Construction Dam	E&S-36	SESC Manual	Isolate construction activities	X				X
Dewatering by Filter Bag/Sediment Basin	E&S-18	SESC Manual	Filter sediment laden water	X			X	
Diversion Dike	E&S-10	SESC Manual	Protection of sensitive areas (hillside) by diversion	X	X			X
Drop Inlet Sediment Trap	E&S-31	SESC Manual	Avoid transport of sediments	X	X			X
Dust Control	E&S-4	SESC Manual	Minimize dust from the construction zone	X			X	
Employee Training		SWMP and O&M Handbook	Education	X	X		X	
Energy Dissipators	E&S-19	HEC-14, SESC Manual	Reduce erosive velocities from storm sewer	X	X			X



Stormwater Best Management Practices (BMPs)

BMP Name	SESC Plan No.	References	Typical Use	Duration		BMP Type		
				Temporary	Permanent	Vegetative	Operational	Structural
Geotextile Silt Fence	E&S-26	SESC Manual	Capture sediment on slopes	X				X
Gravel Access Approach	E&S-14	SESC Manual	Minimize dust and sediment from leaving construction site and entering public roads, lakes and streams	X				X
Gravel Filter Berm	E&S-13	SESC Manual	Filtering of water flow in ditch	X	X			X
Infiltration Trench		Chapter 8	Stormwater storage		X			X
Inlet Protection Fabric Drop	E&S-29	SESC Manual	Filter stormwater before entering inlets	X	X			X
Inlet Protection Geotextile and Stone	E&S-30	SESC Manual	Filter stormwater before entering inlets	X	X			X
Intercepting Ditch	E&S-11	SESC Manual	Protection of sensitive areas (ditch) by diversion	X	X			X
Intercepting Ditch and Diversion Dike	E&S-12	SESC Manual	Protection of sensitive areas by diversion	X	X			X
Litter Control (Maintenance)		O&M Handbook	Environmental improvement		X		X	
Materials Management Plan		Chapter 9, O&M Handbook	Environmental improvement		X		X	
Minimizing Effects of Highway De-icing (Maintenance)		O&M Handbook	Minimize amount of de-icing material in the stormwater		X		X	
Mulch Blankets and High Velocity Mulch Blankets	E&S-33	SESC Manual	Soil stabilization, promote growth of vegetation to protect surface	X		X		
Mulching and Mulch Anchoring	E&S-28	SESC Manual	Soil stabilization, promote growth of vegetation to protect surface	X		X		
Outlet Protection		HEC-11	Prevent soil erosion at outlets	X	X			X
Permanent/ Temporary Seeding	E&S-3	SESC Manual	Soil stabilization, promote growth of vegetation to protect surface	X	X	X		
Pipe Drop	E&S-17	SESC Manual	Control rapid water drops and high flows on slopes from storm sewer		X			X

# Stormwater Best Management Practices (BMPs)

BMP Name	SESC Plan No.	References	Typical Use	Duration		BMP Type		
				Temporary	Permanent	Vegetative	Operational	Structural
Plastic Sheets or Geotextile Cover	E&S-27	SESC Manual	Create a temporary liner for a channel	X				
Pond (Basin)		Chapter 8	Stormwater storage		X			X
Riprap	E&S-7	HEC-11, SESC Manual	Protection at storm sewer outlets and protection of channel banks	X	X			X
Sand and Stone Bags	E&S-24	SESC Manual	Control location of water flow and erosion	X				X
Sand Fence and Dune Stabilization	E&S-25	SESC Manual	Prevent sand from leaving dunes	X				X
Sediment Basin (size > 5 cu. yd.)	E&S-21	SESC Manual	Avoid transport of sediments	X	X			X
Sediment Trap (size < 5 cu. yd.)	E&S-20	SESC Manual	Avoid transport of sediments	X	X			X
Slope Drain Surface	E&S-15	SESC Manual	Control rapid water drops and high flows on slopes	X				X
Slope Roughening and Scarification	E&S-32	SESC Manual	Reduce wind and water erosion	X	X		X	X
Sodding	E&S-5	SESC Manual	Soil stabilization, promote growth of vegetation to protect surface		X	X		
Stream Relocation	E&S-23	SESC Manual	Stabilization of disturbed channels		X			X
Street Sweeping (Maintenance)		O&M Handbook	Removal of street dirt and litter.		X		X	
Temporary Bypass Channel	E&S-35	SESC Manual	Allow the construction site to remain dry	X				X
Trees, Shrubs, Vines and Ground Cover	E&S-16	SESC Manual	Soil stabilization and aesthetic goals		X	X		
Turbidity Curtain	E&S-1	SESC Manual	Isolate construction activities	X				X
Used Oil Recycling Program		O&M Handbook	Environmental protection		X		X	

# Stormwater Best Management Practices (BMPs)

BMP Name	SESC Plan No.	References	Typical Use	Duration		BMP Type		
				Temporary	Permanent	Vegetative	Operational	Structural
Vegetated Buffer at Watercourse	E&S-22	SESC Manual	Sediment and pollutant filtering and reduction of sheet flow velocities	X		X		
Vegetative Buffer Strips	E&S-6	SESC Manual	Reduction of sheet flow velocities and prevent rilling and gulling		X	X		

Note: References in "References" column refer to:

- SWMP = MDOT Stormwater Management Plan
- O&M Handbook = MDOT Operations and Maintenance Handbook
- SESC Manual = MDOT Soil Erosion and Sedimentation Control Manual
- HEC = Hydraulic Engineering Circular
- 9.4.2.2 = Section within this chapter
- Chapter 8 = Chapter within this manual

#### 9.4.2.2 BMP Descriptions and Applications

This section will give additional design information for references made to "the engineer" within MDOT's *SESC Manual*. Specifically, additional design information is provided for the following BMPs: check dam, diversion dike, energy dissipators, gravel filter berm, intercepting ditch, intercepting ditch and diversion dike, pipe drop, riprap, slope drain surface, stream relocation, temporary bypass channel, and turbidity curtain.

**Aggregate Cover** – Details can be found in the *SESC Manual* (E&S-8). This BMP can be used as either a temporary or permanent BMP and is classified as structural.

Applications – Used to stabilize soils in high traffic areas, equipment storage areas, or areas which would develop into a soil erosion problem as a result of intensive activities and loss of vegetative cover.

**Benches** – Details can be found in the *SESC Manual* (E&S-9). This BMP can be used as either a temporary or permanent BMP and is classified as structural.

Applications – Creative grading technique used on long slopes to prevent sheet flow from gaining velocity which may result in soil erosion and sedimentation problems.

**BMP Inspection and Maintenance Plan** – Plans to regularly inspect and maintain BMPs to assure their effectiveness and structural integrity. Details can be found in the MDOT SWMP. This BMP should be used permanently and is classified as operational.

Applications – All BMPs should be regularly inspected and maintained.

**Check Dam** – A device constructed across ditch lines used to reduce velocity of concentrated flows in the ditch and to protect vegetation. Details can be found in the *SESC Manual* (E&S-37). This BMP is temporary and is classified as structural.

Applications – Check dams are constructed to reduce the velocity of concentrated flows and protect vegetation. Although check dams also collect sediment, and hence act as filters, their primary purpose is to reduce erosive velocities. Check dams should be used when it is not practical to divert flow to a stabilized outlet or where weather conditions prevent the timely installation of vegetation or non-erosive liners.

Factors Affecting Preliminary Design – Consideration should be given to slope and depth of the ditch, design flow, and design velocity. These items will dictate stone size and other physical features.

Implementation – Check dams should be applied during the construction of ditches and diversions and before vegetation is established. Stone should be placed in the ditch banks and extended a minimum of 18 inches above the anticipated flow to avoid washouts from overflow around the dam. The area downstream of the last check dam should be stabilized or the flow diverted to a stabilized outlet.

Design Example – See HEC-14 for examples of check dam design.

Maintenance Requirements – A Certified Stormwater Operator should inspect check dams after each precipitation event that results in a discharge to ensure there is no piping under the structure or around its banks during construction. All damage should be corrected immediately. If banks are severely eroded, consider other stabilization options. Sedimentation should be removed when it accumulates to one-half the height of the dam to ensure water can flow through the dam and to prevent large flows from carrying sediment over the dam. Add stones as needed to maintain design height and cross section. Also, be sure that culverts and other structures below the check dam are not damaged or blocked due to any displaced stone.

**Clean and Maintain Storm Drain Ditches** – Plans to regularly clean and maintain channels to assure their effectiveness. Details can be found in MDOT's O&M Handbook. This BMP should be used permanently and is classified as operational.

Applications – All storm drainage channels should be regularly cleaned and maintained.

**Clean and Maintain Storm Inlet and Catch Basins** – Plans to regularly clean and maintain inlets and catch basins to assure their effectiveness. Details can be found in MDOT's O&M Handbook. This BMP should be used permanently and is classified as operational.

Applications – All storm inlets and catch basins should be regularly cleaned and maintained.

**Cofferdam** – A temporary dam placed to prevent flow from entering the project site area. Details can be found in the *SESC Manual* (E&S-34). This BMP should be used temporarily and is classified as structural.

Applications – Use where a dry construction site within the streambed is required.

**Construction Dam** – A temporary dam placed to prevent from entering the project site area. Details can be found in the *SESC Manual* (E&S-36). This BMP should be used temporarily and is classified as structural.

Applications – Construction dams should be used when a dry or slack water area is necessary to isolate construction activities from the watercourse. A construction dam can be used for a shorter duration than a cofferdam.

**Dewatering by Filter Bag/Sediment Basin** – A method of releasing water and cleaning from a depressed area. Details can be found in the *SESC Manual* (E&S-18). This BMP is temporary and classified as operational.

Applications – Dewatering with a filter bag should be used on retained water (cofferdam, sediment basin) being discharged to surface waters. It may be used in conjunction with a sediment basin.

**Diversion Dike** – A temporary or permanent ridge of compacted earth constructed across sloping land to protect work or sensitive areas from upslope runoff by diverting flow away. Details can be found in the *SESC Manual* (E&S-10). This BMP can be used as either a permanent or temporary BMP and is classified as structural.

Applications – Diversion dikes are best utilized in construction areas where runoff can be diverted and properly outletted to control erosion, sedimentation, or flood damage. Specific locations are listed on the *SESC Manual* detail sheet.

Design Criteria – It is important that engineers design diversion dikes; too steep a slope can result in erosive velocity behind the diversion dike or at the outlet. The design example given in MDEQ's *Guidebook of BMPs for Michigan Watersheds* gives designer's guidance on proper design velocities.

Factors Affecting Preliminary Design – Changes in slope from steep to flat may cause unwanted deposition to occur. The deposition can reduce the carrying capacity and may cause overtopping and failure. Designers should also consider the type of soil and vegetation that will be used in the dike.

Implementation – Diversion dikes should be stabilized with topsoil, seed, and mulch or mulch blankets immediately after completion. Any excavated or surplus soil shall be disposed of in an upland area outside any floodplain or wetland areas

Maintenance Requirements – Frequent inspection and timely maintenance are essential to the proper functioning of a diversion dike. Diversion dikes should be inspected after each storm to ensure there is no piping under the dike. Damage should be repaired immediately.

**Drop Inlet Sediment Trap** – A temporary device used to trap sediment from stormwater before it enters the storm sewer system. Details can be found in the *SESC Manual* (E&S-31). This BMP can be used as either a temporary or permanent BMP and is classified as structural.

Applications – Should be used on construction sites with sediment-laden runoff where minimal flows are expected to enter a catch basin and settling of large particles is desired.

**Dust Control** – Means of limiting dust generated during construction by grade watering or other methods. Details can be found in the *SESC Manual* (E&S-4). This BMP should be used temporarily and is classified as operational.

Applications – Should be used during construction to minimize amount of dust leaving the site.

**Employee Training** – Training MDOT employees to be aware of BMPs and their importance. Details can be found in the MDOT SWMP and the O&M Handbook. This BMP is permanent and classified as operational.

Applications – All appropriate MDOT staff should be trained.

**Energy Dissipators** – Structures used to control erosion in a channel or conduit. Details can be found in the *SESC Manual* (E&S-19) and HEC-14. This BMP can be used as either a temporary or permanent BMP and is classified as structural.

Applications – Use energy dissipators to reduce velocity of flow and dissipate energy at outlets of channels or conduits which will, in turn, reduce erosion.

Design Criteria – Design criteria for energy dissipators is given in FHWA's publication HEC-14, *Hydraulic Design of Energy Dissipators for Culverts and Channels*.

Factors Affecting Preliminary Design – Factors to be considered include peak flow, velocity of flow, slope of the channel, and shape of the channel.

Implementation – For guidance on how to implement energy dissipators, see HEC-14.

Maintenance Requirements – Frequent inspection and timely maintenance are essential to the proper functioning of energy dissipators. Energy dissipators should be inspected after large storm events to ensure there is no piping or damage to the dissipator. Damage should be repaired immediately.

**Geotextile Silt Fence** – A permeable barrier used to capture sediment from sheet flow. Details can be found in the *SESC Manual* (E&S-26). This BMP should be used temporarily and is classified as structural.

Applications – Use adjacent to disturbed areas to capture sediment from sheet flow.

**Gravel Access Approach** – A temporary construction access road which helps minimize dust and tracking of loose materials from the work site to public roadways. Details can be found in the *SESC Manual* (E&S-14). This BMP should be used temporarily and is classified as structural.

Applications – Use as a transition roadway between public roads and the construction site.

**Gravel Filter Berm** – A gravel filter used to clean water as it flows through. Details can be found in the *SESC Manual* (E&S-13). This BMP should be used temporarily and is classified as structural.

Applications – Gravel filter berms are to be placed wherever a concentrated water flow requires filtering before leaving the construction site.

Design Criteria – In profile, standard dimensions as indicated on SESC detail sheets should be used. In cross section, berm dimensions (e.g., bottom width and side slope) should be sized such that peak velocity is less than or equal to 2 feet per second. The water surface in the ditch downstream of the berm should be 6 to 12 inches below the crest of the berm.

Factors Affecting Preliminary Design – The factors that affect preliminary design include peak flow rate and slope of the ditch.

Implementation – Gravel filter berms are temporary in nature and shall be installed during times of active construction before water is released from dewatering area.

Design Example – Given the following:

Q<sub>peak</sub> = 16 cfs  
Ditch Slope = 0.2 %  
Ditch Bottom Width = 4 feet  
Side slopes = 1V:4H  
Manning's n = 0.025  
y, Normal Depth (from Manning's equation) = 1 foot

$$Q = (1.486/n)(A)(R)^{(2/3)}(S)^{(1/2)}$$

Where: A = 4y + y(4y)  
R = A/P  
P = 4 + 2y(17)<sup>(1/2)</sup>  
S = 0.002 feet/feet

Area in the channel at normal depth = 8 sf

Velocity in the channel = 2 feet per second (16 cfs/8 sf)

The velocity is 2 feet per second at the downstream face; therefore, installing 24 inches of stone will provide 1 foot of freeboard.

Maintenance Requirements – A Certified Stormwater Operator should inspect gravel filter berms after each precipitation event that results in a discharge to ensure there is no piping under the structures or around banks during construction. All damage should be corrected immediately. Sedimentation should be removed when it accumulates to one-half the height of the berm to ensure water can flow through the berm and to prevent large flows from carrying sediment over the berm. Add/replace stones as needed to maintain design height, cross section, and filtering ability. Also, be sure that culverts and other structures below the berm are not damaged or blocked due to any displaced stone.



**Infiltration Trench** – An excavated trench, backfilled with stone aggregate and lined with filter fabric. Used to treat small areas of runoff by detaining stormwater for short periods until it infiltrates down into the groundwater table. Details can be found in Chapter 8, Stormwater Storage Facilities. This BMP should be used permanently and is classified as structural.

Applications – The use of an infiltration trench requires the following conditions:

- Permeable native soil.
- Small drainage areas.
- No convenient surface water outlet available or surface water is sensitive to the discharge.
- Location is available to facilitate maintenance.

**Inlet Protection Fabric Drop** – Geotextile fabric barrier built up around storm sewer inlets to prevent sediment and debris from entering the storm sewer system. Details can be found in the *SESC Manual* (E&S-29). This BMP should be used temporarily and is classified as structural.

Applications – Use to capture sediment runoff during construction at the approach to storm drain inlets where sediment-laden runoff is expected. Use in nonpaved areas.

**Inlet Protection Geotextile and Stone** – Geotextile fabric placed over curb openings then covered with stone to prevent sediment and debris from entering the storm sewer system. Details can be found in the *SESC Manual* (E&S-30). This BMP should be used temporarily and is classified as structural.

Applications – Use in paved areas on storm inlets at curb openings where flows are expected to be minimal but filtration is desired.

**Intercepting Ditch** – An intercepting ditch is a long, narrow ditch excavated into the earth on the upslope or downslope of a drainage area. It is used to intercept storm runoff and divert it to a safe outlet location where sediment can be removed by slowing down water velocities. Details can be found in the *SESC Manual* (E&S-11). This BMP can be used as either a permanent or temporary BMP and is classified as structural.

Applications – Intercepting ditches are best utilized in construction areas where runoff can be diverted to control erosion, sedimentation, or flood damage. Specific locations are listed in the *SESC Manual* details.

Design Criteria – It is important that engineers design intercepting ditches; too steep a slope can result in erosive velocity behind the diversion dike or at the outlet. The design example given in MDEQ's *Guidebook of BMPs for Michigan Watersheds* gives designer's guidance on proper design velocities.

Factors Affecting Preliminary Design – Factors include: type of soil, type of vegetation, profile and cross section, size of the drainage area, and peak runoff. Changes in slope from steep to flat may cause unwanted deposition to occur. The deposition can reduce carrying capacity and may cause overtopping and failure.

Implementation – Any excavated or surplus soils shall be disposed of in an upland area outside any floodplain or wetland areas. Excavated soils must be adequately stabilized by the use of seed, mulch, or mulch blankets in sufficient quantities to prevent erosion and subsequent siltation to any off-site areas, floodplains, wetlands, lakes, or streams. If the intercepting ditch remains a permanent BMP, seed and high velocity mulch blankets must be placed and anchored throughout the limits of the ditch.

Maintenance Requirements – Frequent inspection and timely maintenance are essential to the proper function of an intercepting ditch. Damages should be repaired immediately.

**Intercepting Ditch and Diversion Dike** – Combination of using both an intercepting ditch and dike as described above. Details can be found in the *SESC Manual* (E&S-12). This BMP can be used as either a permanent or temporary BMP and is classified as structural.

Applications – Use to intercept sediment-laden storm runoff by diverting it to safe outlet areas where sediments can be removed by slowing down the water velocity, or divert water away from disturbed areas.

Design Criteria – It is important that engineers design intercepting ditches and diversion dikes; too steep a slope can result in erosive velocity behind the diversion dike, within the ditch, or at the outlet. The design example given in MDEQ's *Guidebook of BMPs for Michigan Watersheds* gives designers guidance on design velocities.

Factors Affecting Preliminary Design – Changes in slope from steep to flat may cause unwanted deposition to occur. The deposits can reduce the carrying capacity of the ditch and may cause overtopping and failure. Designers should also consider the type of soil and vegetation that will be used.

Implementation – See practices listed for diversion dike or intercepting ditch.

Maintenance Requirements – See maintenance requirements listed for diversion dike or intercepting ditch.

**Litter Control (Maintenance)** – Controlling litter to reduce potential clogging, and properly disposing of paper, plastic, and glass. Details can be found in the MDOT O&M Handbook. This BMP should be used permanently and is classified as operational.

Applications – Litter control should be applied during MDOT activities such as:

- Prior to mowing.
- Construction.
- Reconstruction.
- Rest area maintenance/construction.
- Operations and maintenance activities.

**Materials Management Plan** – Identify hazardous and non-hazardous materials in the storage locations that require special handling, storage, and disposal. Details can be found in MDOT's O&M Handbook. This BMP should be used permanently and is classified as operational.

Applications – Should be used in handling and cleaning of equipment.

**Minimizing Effects of Highway De-icing (Maintenance)** – Reducing effects caused by using salt and other de-icing materials on roadways (i.e., calibration of salt trucks). Details can be found in MDOT's O&M Handbook. This BMP should be used permanently and is classified as operational.

Applications – Effects of highway deicing material should be minimized whenever they are applied.

**Mulch Blankets and High Velocity Mulch Blankets** – Placement of degradable cloth type blankets to provide immediate and effective cover over raw erodible slopes. Details can be found in the *SESC Manual* (E&S-33). This BMP should be used temporarily and is classified as vegetative.

Applications – Use when immediate erosion protection over raw erodible slopes or ditch bottoms is needed to protect against rain and runoff. This BMP generally is used for more challenging applications (steep slopes and ditches) than conventional mulch. Guidelines for permanent stabilization treatments for various ditch grades are listed in Chapter 4, Natural Channels and Roadside Ditches, Section 4.4.3.2.3, Table 4-5.

**Mulching and Mulch Anchoring** – Covering exposed soil areas with straw mulch, mulch blankets, or high velocity mulch blankets. Details can be found in the *SESC Manual* (E&S-28). This BMP should be used temporarily and is classified as vegetative.

Applications – Use to provide immediate erosion protection and promote vegetative growth.

**Outlet Protection** – Methods of preventing soil erosion at structure outlets. Methods of outlet protection are discussed in FHWA, HEC-14. Details can be found in HEC-11. This BMP can be used as either a temporary or permanent BMP and is classified as structural.

Applications – Use whenever erosive velocities are expected at outfalls/outlets.

**Permanent/Temporary Seeding** – An inexpensive, yet effective, method of stabilizing flat areas and slopes. Details can be found in the *SESC Manual* (E&S-3). This BMP can be used as either a temporary or permanent BMP and is classified as vegetative.

Applications – Use to establish protective cover on flat areas and slopes by encouraging vegetation.

**Pipe Drop** – A pipe installed which allows water to drop in elevation very rapidly without causing erosive conditions. Details can be found in the *SESC Manual* (E&S-17). This BMP should be used permanently and is classified as structural.

Applications – Applications include areas where the concentration and velocity of water are such that head cutting or gully erosion will occur, where beds of intersecting channels are at different elevation, and where a flatter grade is needed for stability in a proposed channel. The inlet can be designed to promote sedimentation.

Design Criteria – This BMP requires consultation with the Design Engineer - Hydraulics/Hydrology prior to specification on the plans. Pipe drops located in or adjacent to streams or other watercourses may require a permit from MDEQ.

Factors Affecting Preliminary Design – Soils should be stable and able to support the planned structure with no piping. The drainage area above the structure should be protected against erosion. The channel below the selected site must be stable for the design flow. Designers should also consider the effect the pipe drop may have on the water table.

Implementation – Implementation of this BMP should occur early in the construction sequence. A common failure of the pipe drop is caused by water saturating the soil and seeping (piping) along the pipe. This creates voids and washouts. Proper backfilling around and under the pipe haunches with stable soil will eliminate this type of failure by creating firm contact between the pipe and the soil.

Design Example – Design of a slope drain subsurface is similar to design of a storm sewer. An example of storm sewer design is given in Chapter 7, Road Storm Drainage Systems. The following general steps can be followed:

1. Once a preliminary pipe size is determined, the designer should calculate the hydraulic grade line through the pipe. There will be some losses associated with the friction of the pipe, a 90-degree bend, entrance and exit losses, and a loss to overcome the grate and/or inlet safety guards.
2. If the water surface elevation at the upstream end is unacceptable or causes harmful interference, a larger pipe size should be considered.
3. Once the water surface elevation at the inlet has been determined, the size/height of the diversion dike can be determined.

**Maintenance Requirements** – The pipe drop should be inspected regularly for seeping (piping) near the pipe. The pipe should also be inspected for any blockage/clogging material. Any damage or failing parts should be repaired or replaced immediately. If the pool at the upstream end becomes more than one-half filled with sedimentation, it should be cleaned. Any vegetation or erosion problems should be addressed as soon as possible.

**Plastic Sheets** – A liner used to prevent soil erosion. Details can be found in the *SESC Manual* (E&S-27). This BMP should be used temporarily and is classified as structural.

**Applications** – Use in temporary channels or as a temporary cover of stockpiled materials to prevent soil erosion.

**Pond (Basin)** – Method of holding stormwater temporarily with a controlled release rate. Details can be found in Chapter 8, Stormwater Storage Facilities. This BMP should be used permanently and is classified as structural.

**Applications** – Use where detention of stormwater is necessary to limit the peak rate released from the site into downstream conveyance systems. Can be designed to promote sedimentation in the basin.

**Riprap** – Placement of large rocks and cobbles. Details can be found in the *SESC Manual* (E&S-7) or in HEC-11. This BMP should be used permanently and is classified as structural.

**Applications** – Use to dissipate energy or stabilize channel beds and banks where vegetative measures will not be stable. Use on steep slopes, as channel liners, at inlets and outlets for culverts, and as shoreline protection.

**Design Criteria** – This BMP is used to stabilize stream banks and line channels, and provide stable outlets. All work conducted below the ordinary high water mark of a lake or stream, or in a floodplain or wetland will require permits from MDEQ. Riprap is generally designed to be stable, with appropriate factors of safety, for the 1 percent chance (100-year) storm. MDOT generally recommends the layer thickness be increased by 50 percent if installed underwater. Generally, MDOT uses heavy riprap as protection for bridges. A geotextile or aggregate filter placement is recommended below the riprap.

**Factors Affecting Preliminary Design** – Riprap structures should be designed by licensed professional engineers or other persons qualified in the design of such structures. Water velocity, water depth, stone density, stone shape, steepness of side slope, type of watercourse, application (piers, abutments, channels, etc.), and flow condition should all be considered in the preliminary design.

Implementation – Riprap should consist of stones 8-inch diameter or more. The stone should be hard, angular, and of such quality that it will not disintegrate on exposure to water or weathering. Guidance on implementation of riprap can be found in the MDEQ's *Guidebook of BMPs for Michigan Watersheds* and HEC-11.

Design Example – For a design example see *HEC-11*.

Maintenance Requirements – Inspections should be done at all sites immediately after the first storm following installation or riprap. This is particularly important in areas where riprap displaced during the storm would impact culverts. Thereafter riprap sites should be checked following large storms, especially those that are near or exceed the storm frequency used in the design. Displaced riprap should be removed from its downstream location and new riprap placed.

**Sand and Stone Bags** – Sand and stone bags are a useful tool in prevention of erosion. Used to prevent stormwater access to a site. Details can be found in the *SESC Manual* (E&S-24). This BMP should be used temporarily and is classified as structural.

Applications – Use to create check dams and for headwalls on temporary culvert crossings.

**Sand Fence and Dune Stabilization** – Traps blowing sand by reducing wind velocities. Details can be found in the *SESC Manual* (E&S-25). This BMP should be used temporarily and is classified as structural.

Applications – Use to prevent sand from blowing onto roads or offsite areas. Works well for building up areas of sand where blowouts have occurred.

**Sediment Basin (Size greater than 5 cubic yards)** – Used to trap sediments from an upstream construction site. Provides a pool for velocities to slow down and sediment to drop out of traveling water. Details can be found in the *SESC Manual* (E&S-21). This BMP can be used as either a temporary or permanent BMP and is classified as structural.

Applications – Use as a last effort to collect sediments from an upstream construction site. Use to settle out sediment and large debris in rivers, streams, or large watercourses. Use if filter fences, turbidity curtains, cofferdams, and other practices will not be able to keep soil from moving downstream.

Design Criteria – A permit from MDEQ will be required for any in-stream sediment basin. The sediment basin should be used to reduce the water velocity to a level that will promote sedimentation in the basin and provide an area for the sediment to accumulate.

Factors Affecting Preliminary Design – Sediment basins are often converted to stormwater detention basins after the completion of the construction project. It is, therefore, important to determine from the onset what the ultimate fate of the basin

will be and design accordingly. Factors that influence the design of the sediment basin include the amount of tributary drainage area, the permeability of the drainage area, the type of soils on the construction site, and location.

Implementation – Locate sediment basins where the largest storage capacity can be obtained with the least amount of earthwork, such as in natural depressions and drainage ways.

Design Example – For a design example, see MDEQ's *Guidebook of BMPs for Michigan Watersheds*.

Maintenance Requirements – Maintenance should be done following every storm. If the depth of sediment deposit has exceeded 50 percent of the total depth, the basin should be cleaned. Sediment removed should be placed at an upland area and stabilized so that it does not re-enter the drainage course. The basin should be checked for piping or seepage. Any damage discovered during maintenance should be corrected immediately.

**Sediment Trap (Size less than 5 cubic yards)** – Used to intercept concentrated flows and prevent sediments from being transported offsite or into a watercourse or wetland. Provides a pool for velocities to slow down and sediment to drop out of traveling water. Details can be found in the *SESC Manual* (E&S-20). This BMP can be used as either a temporary or permanent BMP and is classified as structural.

Applications – Use in any area where concentrated flow would result in the transport of sediments offsite into a water body or wetland area. Use to settle out sediment and large debris in ditches or small watercourses. Use if filter fences, turbidity curtains, cofferdams, and other practices will not be able to keep soil from moving downstream.

Design Criteria – A permit from MDEQ will be required for any in-stream sediment trap. The sediment trap should be used to reduce the water velocity to a level that will promote sedimentation in the trap and provide an area for the sediment to accumulate.

Factors Affecting Preliminary Design – Factors that influence the design of the sediment trap include the amount of tributary drainage area, the permeability of the drainage area, the type of soils on the construction site (clays have more erosion potential than sands), and location.

Implementation – Locate sediment basins where the largest storage capacity can be obtained with the least amount of earthwork, such as in natural depressions and drainage ways. Do not place sediment basins in or immediately adjacent to wetlands.

Design Example – For a design example see MDEQ's *Guidebook of BMPs for Michigan Watersheds*.

**Maintenance Requirements** – Observations should be made as necessary to ensure satisfactory trapping of sediment. Maintenance should be done following every storm.

If the depth of sediment deposit has exceeded 50 percent of the total depth, the basin should be cleaned. Sediment removed should be placed at an upland area and stabilized so that it does not re-enter the drainage course. The basin should be checked for piping or seepage. Any damage discovered during maintenance should be corrected immediately.

**Slope Drain Surface** – A pipe used to carry water down slopes without causing erosive conditions. Details can be found in the *SESC Manual* (E&S-15). This BMP should be used temporarily and is classified as structural.

**Applications** – The slope drain surface pipe is intended to carry water down slope within a conduit, in a controlled manner, to prevent slope erosion and subsequent siltation. Applications include areas where the concentration and velocity of water are such that head cutting or gully erosion will occur, where beds of intersecting channels are at different elevation, and where a flatter glade is needed for stability in a proposed channel. This should be used only as a temporary device during construction.

**Factors Effecting Preliminary Design** – The amount of flow expected through the culvert, the gradient of the slope, and the type of material used for the slope drain surface will effect the preliminary design. The drainage area above the structure should be protected against erosion. The channel below the selected site must be stable for the design flow. Designers should also consider the effect the slope drain surface may have on the water table.

**Implementation** – The slope drain surface should be placed on undisturbed soil or well-compacted fill.

**Design Example** – The design example given in Chapter 7, Road Storm Drainage Systems, is very similar to the problem of designing a slope drain surface. For additional guidance, in addition to the general steps listed below, see the example problem in Chapter 7.

1. Once a preliminary pipe size has been chosen, the designer should calculate a hydraulic grade line for the pipe. Techniques for calculating losses through the pipe are given in Chapter 7, Road Storm Drainage Systems. It should be noted that the control for the upstream portion of pipe will be the critical depth elevation at the downhill bend.
2. If the water surface elevation determined at the upstream end is determined unacceptable, a larger pipe should be considered.
3. It is very important to place riprap to protect the outlets of these structures because of the high velocities that are expected from the steep slope.



Maintenance Requirements – See maintenance requirement for sewers as discussed in Chapter 7, Road Storm Drainage Systems, Section 7.5.

**Slope Roughening and Scarification** – Use of construction equipment to create grooves or tracks perpendicular to slope direction which reduces soil erosion. Details can be found in the *SESC Manual* (E&S-32). This BMP can be used as either a temporary or permanent BMP and is classified as structural or operational.

Applications – Use to catch rainwater and retain seed, mulch, and fertilizer. Scarification can also be used to minimize runoff velocities.

**Sodding** – Provides an immediate vegetative cover at locations allowed in Standard Plan R-100 Series, such as spillways and grassed waterways. Details can be found in the *SESC Manual* (E&S-5). This BMP should be used permanently and is classified as vegetative.

Applications – Use to provide immediate vegetative cover at locations allowed in Standard Plan R-100 Series. Sod should only be used in areas where seeding or mulch blankets will not work.

**Stream Relocation** – Relocation of the natural channel by moving its location while maintaining the same width, depth, and flow velocity. Details can be found in the *SESC Manual* (E&S-23). This BMP should be used permanently and is classified as structural.

Applications – This BMP may be required if the stream is in danger of becoming contaminated in its current location, or if the stream has an erosive high gradient, in which case relocation would add some length to the stream, lower shear stresses, and lower erosive potential. Other reasons would be if the stream is passing through unacceptably erosive soils.

Design Criteria – Certain habitat structures must be incorporated into its design to mitigate for habitat impacts. These structures include, but are not limited to, rock weirs, plumbs, and others as specified by MDEQ Permit Provisions.

Factors Affecting Preliminary Design – The following factors would affect preliminary design:

- High and low water elevations.
- Peak flows.
- Soil conditions in the existing and proposed locations.
- Slope of banks and longitudinal slope.
- Location within the 1 percent chance (100-year) flood plain.
- Easements and R.O.W. for relocation.
- Permits.

Implementation – Sequence of events are outlined in the *SESC Manual* detail sheet.

Design Example – A sample of the construction sequence and controls are given in the *SESC* detail sheet. The fundamentals of open channel flow are discussed in Chapter 4, Natural Channels and Roadside Ditches, Appendix 4-C. The following must be verified for stream relocation.

- Post-construction velocity must be non-erosive.
- Post-construction channel must not create harmful interference.
- The channel depth must be adequate to facilitate maintenance. A shelved channel should be considered if a deep channel is needed.

Maintenance Requirements – See Chapter 4, Natural Channels and Roadside Ditches, Section 4.5, for guidance on channel maintenance.

**Street Sweeping (Maintenance)** – Street sweeping prevents soils from entering stormwater. Details on scheduling/frequency of street sweeping can be found in MDOT's Operation and Maintenance Manual. This BMP should be used permanently and is classified as operational.

Applications – Street sweeping should be done on a regular basis to prevent street dirt from entering the conveyance system.

**Temporary Bypass Channel** – A temporary bypass channel moves location of channel flow when dry construction sites are necessary. Details can be found in the *SESC Manual* (E&S-35). This BMP should be used temporarily and is classified as structural.

Applications – Temporary bypass channels should be used when a dry construction site is needed in the natural streambed.

Factors Affecting Preliminary Design – The following factors would affect preliminary design:

- High and low water elevations.
- Peak flows.
- Soil conditions in the existing and proposed locations.
- Slope of banks and longitudinal slope.
- Location within the 1 percent chance (100-year) floodplain.
- Easements and R.O.W. for relocation.
- Permits.

Implementation – The construction sequence for a temporary bypass channel is given in the *SESC Manual* detail sheet.

Design Example – Sample construction sequence and controls are listed on E&S-35 detail sheet. The fundamentals of open channel flow are discussed in Chapter 4, Natural Channels and Roadside Ditches, Appendix 4-C. The following must be verified for stream relocation.

- Post-construction velocity must be non-erosive.
- Post-construction channel must not create harmful interference.
- The channel depth must be adequate to facilitate maintenance. A shelved channel should be considered if a deep channel is needed.

Maintenance Requirements – See Chapter 4, Natural Channels and Roadside Ditches, Section 4.5, for guidance on channel maintenance.

**Trees, Shrubs, Vines, and Groundcover** – Details can be found in the *SESC Manual* (E&S-16). This BMP should be used permanently and is classified as vegetative.

Applications – Use to provide low maintenance, permanent erosion protection in the buffer.

**Turbidity Curtain** – A turbidity curtain is used when slack water area is necessary to isolate construction activities from the watercourse. Details can be found in the *SESC Manual* (E&S-1). This BMP should be used temporarily and is classified as structural.

Applications – Turbidity curtains should be used in streams where work will be performed along the banks of the stream and a dry work area is not required. Use turbidity curtains to prevent sediment from entering the watercourse.

Implementation – The turbidity curtain shall be selected based on depth, velocity, and flow of water in the stream. Re-directional barriers (i.e., temporary concrete or steel sheet pile barriers) may be needed at the upstream end of the turbidity curtain in high flow situations.

Maintenance Requirements – Turbidity curtains should be inspected after each rain to ensure there is no piping under the structure or around its banks. Correct all damage immediately.

**Used Oil Recycling Program** – Recycling oil programs prevent used oil from being illegally dumped. Details can be found in MDOT's O&M Handbook. This BMP should be used permanently and is classified as operational.

Applications – Used oil recycling programs should be used to handle all used oil.

**Vegetated Buffers at Watercourse** – A specified width of buffer between construction sites and adjacent watercourses. The buffer helps acts as a filter to reduce soil erosion and sedimentation from entering the watercourse. Details can be found in the *SESC Manual* (E&S-22). This BMP should be used temporarily and is classified as vegetative.

Applications – Use along the toe of slopes or during ditch clean out operations to control sediments from migrating into the watercourse or wetland.

**Vegetative Buffer Strips** – A method to reduce sheet flow velocities which may create rilling and gullyng. Details can be found in the *SESC Manual* (E&S-6). This BMP should be used permanently and is classified as vegetative.

Applications – Use to reduce sheet flow velocities and prevent rilling and gullyng. Also useful to establish permanent vegetative cover and prevent sloughing and loss of seed and mulch.

# **Appendix D**

## **Web site Document Downloads**



**Table D-1 Document Downloads**

<b>File Name</b>	<b>Downloads</b>
Entire Appendix Document Set	7
Entire Annual Report Document Set	10
Annual Report Appendix A	7
Annual Report Appendix B	5
Annual Report Appendix C	7
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Annual Report Appendix F	7
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Annual Report Chapter 2	6
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Annual Report Chapter 7	7
Annual Report Chapter 8	6
Annual Report Chapter 9	6
Annual Report Chapter 10	7
Together... Better Roads, Cleaner Streams Brochure	23
Website Promotion Business Card	16
Drainage Manual Appendix 10 Part A	15
Drainage Manual Appendix 10 Part B	23
Drainage Manual Appendix 2 Part A	35
Drainage Manual Appendix 2 Part B	20
Drainage Manual Appendix 2 Part C	19
Drainage Manual Appendix 2 Part D	66
Drainage Manual Appendix 2 Part D Attachment C	0
Drainage Manual Appendix 2 Part E	19
Drainage Manual Appendix 2 Part F	21
Drainage Manual Appendix 3 Part A	29
Drainage Manual Appendix 3 Part B	58
Drainage Manual Appendix 3 Part C	51
Drainage Manual Appendix 3 Part D	28
Drainage Manual Appendix 4 Part A	4
Drainage Manual Appendix 4 Part A	22
Drainage Manual Appendix 4 Part B	31
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Drainage Manual Appendix 5 Part A	18
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Drainage Manual Appendix 6 Part A	18
Drainage Manual Appendix 6 Part B	21
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Rainfall Study Acknowledgements	4
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Rainfall Study Final Report	14
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Storm Water Management Plan Chapter Document Set	15
Storm Water Management Plan Table of Contents	10
Storm Water Management Plan Chapter 1	8
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Storm Water Management Plan Chapter 5	8
Storm Water Management Plan Chapter 6	7
Storm Water Management Plan Chapter 7	5
Storm Water Management Plan Chapter 8	9
Storm Water Management Plan Chapter 9	9
Storm Water Management Plan Chapter 10	5
Storm Water Management Plan Chapter 11	5
Ann Arbor NPDES Permit	9
Flint NPDES Permit	9
Grand Rapids NPDES Permit	6
Sterling Heights NPDES Permit	8
Warren NPDES Permit	9
<b>Total (Including 4 not listed above)</b>	<b>1759</b>

Note: The counts reflect only those downloads executed during May and June 2003 and a portion of November 2002. The counts for July, August, September, and October 2002 were lost due to a problem during the conversion to the michigan.gov Website format. Counts for December 2002 and January, February, March, and April of 2003 were lost due to another problem related to the aforementioned conversion.



## **Appendix E**

### **Updates to Construction Permit Manual**

#### **A. IDEP Enforcement Procedure**

#### **B. Tap- In Procedure**



**ILLICIT DISCHARGES INTO MDOT  
STORM WATER DRAINAGE SYSTEMS**

September 4, 2003

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**Purpose**

Environmental contamination that migrates into MDOT's storm sewer system *may* affect MDOT's statewide National Pollution Discharge Elimination System (NPDES) storm water discharge permit, such that MDOT can be cited for violations; even though MDOT is not responsible for causing the contamination. Therefore, the following instructions shall be utilized when MDOT receives information or referrals regarding alleged illicit connections or discharges to MDOT storm sewer systems.

**Authority**

1925 PA 368, Highway Obstructions and Encroachments; Use of Highway by Public Utilities

**General Information**

**Record Keeping**

It is very important to record all information, including dates, times, and parties involved. Accurate field notes should be maintained on all items and information.

**Timeliness**

The complaint or referral must be investigated within a reasonable time frame. Failure to respond within a reasonable time frame can jeopardize future enforcement actions, should they become necessary.

**Scenarios where Illicit  
Discharges and Connections  
May Be Encountered**

Illicit discharges/connections will be encountered in three ways. They will be identified based on screening activities pursuant to MDOT's storm water discharge permit. They will be discovered as a result of complaints or referrals from other agencies or the public. They will also be encountered during construction activities. A separate section at the end of this procedure describes how to address those found during construction activities.

**For Illicit Discharges/Connections Not Found During Construction:**

**Field Inspector  
Responsibility**

The Region Resource Specialist, utilities engineer, or other individual as designated by the Region Engineer shall be responsible for coordinating the investigation to confirm an illicit discharge/connection exists and the source of that connection/discharge. The designated staff shall also prepare "Notice and Order to Remove Encroachment" forms and letters as described later in this procedure, and make recommendations for future actions by using the following procedures and the MDOT

**ILLCIT DISCHARGES INTO MDOT  
STORM WATER DRAINAGE SYSTEMS**

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IDEP Field Protocol Manual. If MDOT has hired a consultant to conduct investigations and evaluations of illicit connections/discharges, the MDOT staff indicated above should coordinate with the MDOT Storm Water Program Manager to have that consultant conduct necessary investigations. In all cases, if investigation of a discharge appears to be of an emergency nature, MDOT staff will contact the PEAS system to notify DEQ of the emergency. If possible, MDOT staff will also attempt to make direct contact with appropriate DEQ staff to report the emergency.

**Complaint Documentation**

The following information should be documented as applicable:

- Date of complaint/referral
- Principal parties involved
- Description (drain, storm sewer)
- Location
- Address
- Complexity (multiple or single points of discharge)
- Referral name, if any
- Connection location related to ROW

If a municipality is involved, contact shall be made with the appropriate municipal storm water system manager as soon as possible to coordinate complaint investigation.

**Complaint Validity &  
Analysis**

The validity of the complaint shall be determined by the field inspector or MDOT consultant.

**Complaint not Justified**

If the information or referral is not justified, further action is not warranted. A written response shall be sent to the party making the referral, if any, and all documentation shall be filed at the Region/TSC and copied to MDOT's Storm Water Program Manager for reporting to DEQ. If a consultant conducts the investigation, the consultant shall document its findings to the MDOT staff requesting the investigation. That documentation shall be retained at the Region/TSC and copied to MDOT's Storm Water Program Manager for reporting to DEQ.

**Complaint Justified**

If, during the initial site investigation, it appears that there may be an illicit connection/discharge into MDOT's storm water system, further investigation is warranted. MDOT staff, or, if the investigation is being done by a consultant, the consultant, shall investigate in

**ILLICIT DISCHARGES INTO MDOT  
STORM WATER DRAINAGE SYSTEMS**

September 4, 2003

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accordance with the MDOT IDEP Field Protocol Manual. [Any analysis of the alleged illicit discharge characteristics shall](#) be documented.

If investigation of an illicit connection/discharge requires activities on property outside of the MDOT right of way, MDOT staff will seek appropriate permission from relevant property owners for entry onto those properties to complete the investigation. If permission is granted, the permission will be documented and the investigation work will be completed as above. If permission is not obtained, that refusal will be documented and MDOT staff will notify the appropriate DEQ staff by letter (See attached Example A.) that access was refused and to request DEQ's assistance in gaining access to necessary properties for investigation purposes. The MDOT Storm Water Program Manager is to be copied on all correspondence.

If sufficient information has been gathered from investigations already performed to form a basis as to the likely source of the illicit discharge, letters will be sent to that party as indicated in the compliance section of this procedure seeking removal of the discharge/connection. If information gathered from the investigation is insufficient to determine the source of the illicit discharge/connection or DEQ is unable to assist in gaining access to necessary off ROW properties to allow the investigation to be completed, MDOT staff will document these facts and will refer the matter by letter (see attached Example B.) to the DEQ and any appropriate local agencies for further investigation and correction. A copy will be provided to the MDOT Storm Water Program Manager for reporting to DEQ.

**Illicit Connection/Discharge  
is Confirmed**

When an illicit connection/discharge is confirmed, the following procedures shall be followed to eliminate the illicit connection/discharge:

1.

**Notice and Order to Remove Encroachment**

If the investigation confirms that an illicit connection/discharge does exist and the probable source of the discharge is identified, then the owner of the discharging facility shall be sent a letter by certified mail, return receipt requested (See attached Example C.) along with

**ILLICIT DISCHARGES INTO MDOT  
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a completed "Notice and Order to Remove Encroachment" form (Form 2217, attached). If the investigation does not confirm the probable source of the discharge, Example letter C shall be sent to the owner of that portion of the storm water conveyance that connects to MDOT's storm water system and appears to be conveying the illicit discharge to MDOT's storm water system. The letter and form should be signed by the TSC Manager or Region Engineer. The notice shall describe the violation, provide specific response dates, compliance dates and provide a penalty section.

If the owner responds in a timely fashion to the notice, indicating a desire to comply with the conditions indicated in the notice, the "Compliance Section" of this procedure shall be used as a guide to provide specific removal and closure information to the owner.

If the owner responds indicating that some other party is the owner of the storm water conveyance in question, a letter as indicated above will be sent to that party as outlined herein.

If the owner does not respond to the notice, or indicates an intent not to comply with the conditions indicated in the notice, a second letter and notice should be sent, certified mail, return receipt requested. (See attached Example D.) If there is no response to the second notice or the respondent indicates it will not comply, the "Enforcement Section" of this procedure should be used as a guide.

**Compliance**

Use this section after an illicit discharge/connection is confirmed, or when the property owner voluntarily indicates an illicit discharge exists and desires to correct or eliminate the situation.

1. If the property owner desires to correct the violation, by eliminating the discharge, they should be asked to provide a timetable by which they will eliminate the connection or discharge that is causing the violation in a manner that will prevent it's reconnection or resumption. If the illicit discharge/connection can be resolved by issuance of an encroachment permit, MDOT staff will explain how the permit can be obtained and process any submitted permit application. If no timely permit application is submitted, removal of the illicit discharge/connection must be pursued as described herein.
2. Once correction of the illicit discharge/connection is completed the

**ILLICIT DISCHARGES INTO MDOT  
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September 4, 2003

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property owner must submit written documentation describing the correction. If such correction requires excavation or other work within MDOT's right of way, a permit must first be obtained from MDOT through the normal utility permit process before such work may commence.

- 3 Documentation of all actions taken to resolve these connections must be maintained by the Region/TSC, the Region Storm Water Coordinator (if different) and information documenting the notice and removal of the connection or cessation of the discharge provided to MDOT's Storm Water Program Manager for reporting to DEQ as part of annual NPDES permit reporting.

**Enforcement**

Use this section when there is no response to the second certified letter and Notice and Order to Remove Encroachment, or the owner indicates no voluntary compliance actions will be taken, or if the owner fails to submit a timely utility permit application if that compliance option was made available.

1. If the illicit connection/discharge point is within MDOT's right of way, all documentation of discovery, investigation and remediation efforts and responses, if any, from the owner of the discharge/connection shall be forwarded with a memo from the Region Engineer to the MDOT Storm Water Program Manager requesting the matter to be referred for enforcement. The MDOT Storm Water Program Manager will coordinate the referral with the Assistant Attorney General in Charge, Transportation Division, requesting that they file an action under the Encroachment Act or other legal authority as appropriate to enforce removal of the encroachment. If the Assistant Attorney General in Charge of the Transportation Division determines that a referral is not appropriate for their office to file litigation, this will be documented and the matter referred to the appropriate local government and DEQ for enforcement as indicated below.
2. If the illicit discharge/connection point is located outside of state trunkline ROW, a third letter will be prepared to refer the matter to the appropriate local government, the local health department and the appropriate DEQ Water Division District Supervisor for enforcement. The owner/owners of the discharge/connection in question will be copied on this letter. (See Example B.)

**ILLCIT DISCHARGES INTO MDOT  
STORM WATER DRAINAGE SYSTEMS**

September 4, 2003

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**Illicit Discharges/Connections Found During Construction**

When an illicit discharge/or connection is found during construction activities the contractor should notify the engineer or other MDOT staff on site of the discovery, as described on the standard plan note. MDOT staff will determine if there appears to be an illicit discharge/connection present and if it poses a potential emergency situation or not. If the discharge appears to be of an emergency nature, MDOT staff will contact the PEAS system to notify DEQ of the emergency. If possible, MDOT staff will also attempt to make direct contact with appropriate DEQ staff to report the emergency.

If no emergency situation exists and an illicit discharge/connection appears to exist, MDOT staff will make an attempt to identify the party responsible for the illicit connection/discharge and seek removal of the illicit discharge/connection through direct contact with that party. If MDOT staff can not determine if an illicit discharge/connection exists or can not identify the party responsible in a period of time sufficiently brief as to not unduly delay necessary construction activities, the location of the connection/discharge will be noted, reported to the Region Stormwater Coordinator for follow up in accordance with the previous sections of this procedure, and construction will continue.



[EXAMPLE A]



JENNIFER M. GRANHOLM  
GOVERNOR

STATE OF MICHIGAN  
**DEPARTMENT OF TRANSPORTATION**  
LANSING

GLORIA J. JEFF  
DIRECTOR

September 23, 2003

Water Division District Supervisor  
Department of Environmental Quality

Dear :

The Michigan Department of Transportation (MDOT) is currently investigating its storm sewer system within **{enter name of jurisdiction}**. Information gathered during the course of this investigation indicates that an illicit discharge/connection is originating from property adjacent to MDOT's right of way and entering into MDOT's storm sewer system. MDOT lacks legal authority to enter onto properties outside of MDOT's right of way and has been unable to obtain voluntary permission from adjacent property owners for MDOT to conduct investigations on these properties. As a result MDOT is unable to investigate this possible illicit discharge/connection as required under our NPDES Storm Water Discharge Permit.

This letter is to request your assistance in obtaining legal access for MDOT to complete the investigation described above. Attached to this letter is information describing the properties to which access is needed and the potential scope of investigatory activities MDOT or its consultant may need to undertake under such access. If DEQ is unable to obtain access to enable MDOT to conduct these investigations, MDOT will refer all further follow up actions for this potential illicit discharge or connection to the DEQ or appropriate local jurisdiction.

Please contact me at **{insert phone/e-mail}** to inform me of the status of this request or if you have any questions.

Sincerely,

Region Storm Water Coordinator

Attachments

Cc: local health department  
Local municipality  
TSC Manager/Region Engineer  
MDOT MS4 consultant  
MDOT Storm Water Program Manager

[EXAMPLE B]



JENNIFER M. GRANHOLM  
GOVERNOR

STATE OF MICHIGAN  
DEPARTMENT OF TRANSPORTATION  
LANSING

GLORIA J. JEFF  
DIRECTOR

September 23, 2003

**CERTIFIED LETTER**  
**RETURN RECEIPT REQUESTED**

To DEQ Water Division District Supervisor and/or local jurisdiction as appropriate

Dear :

As part of the Michigan Department of Transportation's (MDOT) on going efforts to investigate its storm sewer system within {enter name of jurisdiction}, we identified potentially illicit connections/discharges to our storm sewer system. *{Pick one of the following as appropriate:*

**We have been unable to obtain voluntary access to properties not within MDOT's right of way that are necessary in order to investigate the potential illicit discharge/connection. Upon MDOT's request DEQ has been unable to provide MDOT with access to these properties. As a result, MDOT is unable to complete investigation of this potential illicit discharge/connection and determine if one exists, who is responsible for it or take appropriate actions to have it eliminated.**

*or*

**Attached to this letter are copies of two certified letters and Orders to Remove Encroachment that were sent to the property owners that we identified as potentially responsible for these connections/discharges. To date this party has {not responded/failed to remedy the illicit connection or discharge}}**

MDOT is required by its National Pollutant Discharge Elimination System permit for the discharge of its storm water to take enforcement actions to eliminate all illicit discharges/connections to its storm sewer system. The purpose of this letter is to inform you that because the illicit connection or discharge exists outside of MDOT's right of way, {insert if appropriate – and MDOT has been unable to obtain access to off the right of way properties over which MDOT lacks jurisdiction to enable proper

**investigation}** MDOT lacks the legal authority to take enforcement action against the offending party to remedy this matter. Therefore, by this letter, we are referring this matter to your agency and requesting that you use legal authority available to you to eliminate the identified illicit discharge/connection to MDOT's storm water system.

Please contact **{fill in name and phone}** if you have any questions or need additional information.

Sincerely,

TSC Manager or Region Engineer

Attachments

Cc:: property owner(s) in question  
local health department  
Local municipality  
DEQ Water Division District Supervisor (if not addressee)  
MDOT MS4 consultant  
MDOT Storm Water Program Manager  
Region Storm Water Coordinator

[EXAMPLE C]



JENNIFER M. GRANHOLM  
GOVERNOR

STATE OF MICHIGAN  
DEPARTMENT OF TRANSPORTATION  
LANSING

GLORIA J. JEFF  
DIRECTOR

September 23, 2003

**CERTIFIED LETTER**  
**RETURN RECEIPT REQUESTED**

Address

Dear Property Owner:

The Michigan Department of Transportation (MDOT) is currently investigating its storm sewer system within **{enter name of jurisdiction}**. Information gathered during the course of this investigation indicates that an illicit discharge/connection is originating from your property and entering into MDOT's storm sewer system. Attached to this letter is a Notice and Order to Remove Encroachment and additional information describing the illicit discharge/connection.

The Federal Clean Water Act and Part 31, Water Resources Protection of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended and regulations promulgated pursuant to these statutes mandate that only clean storm water or potable water can be discharged to a system that discharges to the waters of the State. Your property could be discharging pollutants to MDOT's storm sewer system in violation of these laws and in violation of the Highways Obstructions and Encroachments Act, 1925 PA 368.

The attached Notice and Order directs that you remove this encroachment within 30 days after receipt of this letter. By **{insert date}** you must provide documentation to this office describing what actions you have taken to resolve this matter. If you are unable to remove this encroachment within that time, you must provide information to this office by **{insert date}**, describing the specific steps and schedule by which you will remove this encroachment. By copy of this letter we are notifying the Michigan Department of Environmental Quality and **{insert name of municipal jurisdiction and local health department if appropriate}** of this information.

Please contact **{fill in name and phone}** if you have any questions.

Sincerely,

TSC Manager or Region Engineer

Attachments

Cc: local health department  
Local municipality  
DEQ Water Division District Supervisor (if not addressee)  
MDOT MS4 consultant  
MDOT Storm Water Program Manager  
Region Storm Water Coordinator

[EXAMPLE D]



JENNIFER M. GRANHOLM  
GOVERNOR

STATE OF MICHIGAN  
DEPARTMENT OF TRANSPORTATION  
LANSING

GLORIA J. JEFF  
DIRECTOR

September 23, 2003

**CERTIFIED LETTER**  
**RETURN RECEIPT REQUESTED**

Address

Dear Property Owner:

On {date} I sent you a letter indicating that the Michigan Department of Transportation (MDOT) is currently investigating its storm sewer system within **{enter name of jurisdiction}**. That letter also informed you that information gathered during the course of this investigation indicates that an illicit discharge/connection is originating from your property and entering into MDOT's storm sewer system. Attached to that letter was a Notice and Order to Remove Encroachment and additional information describing the illicit discharge/connection. My {date} letter required that you either remove the illicit discharge/connection by {date} or respond by {date} describing what actions you were going to take to eliminate this discharge/connection. To date we have not received a response from you to that letter **(or response indicated that you would not take actions to adequately resolve this matter)**.

MDOT is required by its National Pollutant Discharge Elimination System permit for the discharge of its storm water to take enforcement actions to eliminate all illicit discharges/connections to its storm sewer system. The purpose of this letter is to inform you that if you do not remove the discharge/connection described in my {date} letter by **{insert date}**, MDOT will refer this matter for appropriate enforcement actions to eliminate this illicit connection/discharge to MDOT's storm sewer system.

By **{insert date}** you must provide documentation to this office describing what actions you have taken to resolve this matter. **{if within MDOT ROW insert the following: If you do not resolve this matter by this date, we will refer this matter to the Department of Attorney General to initiate appropriate enforcement actions to remove this illicit connection/discharge.}** By copy of this letter we are notifying the Michigan Department of Environmental Quality and **{insert name of municipal jurisdiction and local health department if appropriate}** of this information.

Please contact **{fill in name and phone}** if you have any questions.

Sincerely,

TSC Manager or Region Engineer

Attachments

Cc: local health department  
Local municipality  
DEQ Water Division District Supervisor (if not addressee)  
MDOT MS4 consultant  
MDOT Storm Water Program Manager  
Region Storm Water Coordinator





JENNIFER M. GRANHOLM  
GOVERNOR

STATE OF MICHIGAN  
DEPARTMENT OF TRANSPORTATION  
LANSING

GLORIA J. JEFF  
DIRECTOR

2217 (01/03)  
PREVIOUSLY 445A

## NOTICE AND ORDER TO REMOVE ENCROACHMENT

*This information required by Act 368, PA. of 1925, in order to  
remove all encroachments upon Michigan State Trunkline Highways.*

NOTICE TO (NAME): \_\_\_\_\_

ADDRESS \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

YOU ARE HEREBY NOTIFIED as the owner of \_\_\_\_\_  
\_\_\_\_\_

which is (are) located partly on or adjacent to the following described property: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

that you cannot legally erect and/or maintain a certain \_\_\_\_\_  
\_\_\_\_\_

on said premises, which encroaches upon Michigan State Trunkline Highway \_\_\_\_\_  
\_\_\_\_\_.

This encroachment is located in section \_\_\_\_\_, township \_\_\_\_\_, range \_\_\_\_\_,  
county \_\_\_\_\_.

YOU ARE HEREBY ORDERED TO REMOVE THE SAID ENCROACHMENT WITHIN 30 DAYS AFTER  
RECEIPT OF A COPY OF THIS ORDER.

YOU ARE FURTHER NOTIFIED that the Michigan Department of Transportation shall proceed  
to remove such encroachment at your expense if you do not comply with this Order.

THAT ORDER SHALL BE FINAL 30 days after receipt of a copy unless proper action, as provided  
by law, is taken.

\_\_\_\_\_  
TSC MANAGER (SIGNATURE)

\_\_\_\_\_  
DATE

\_\_\_\_\_  
MICHIGAN DEPARTMENT  
OF TRANSPORTATION  
REGION OFFICE ADDRESS  
\_\_\_\_\_

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### **Purpose**

This procedure should help MDOT staff insure that an applicant's/owner's engineer has adequately performed hydrologic and hydraulic analyses in order to thoroughly evaluate potential impacts to MDOT's individual storm water conveyance systems. Although MDOT is not responsible for sizing retention/detention systems (basins, infiltration systems, underground storage, etc.) on private property adjacent to state trunkline right of way (ROW), MDOT does regulate the storm water flow rate and velocity from such systems. Furthermore, MDOT does evaluate the potential impacts from the applicant's property on the water quality of MDOT's storm water conveyance system.

### **Legal Basis and Considerations**

The *quantity* of storm water MDOT is legally obligated to accept is addressed in the Administrative Rules Regulating Driveways, Banners and Parades on or Over Highways, Public Act 200 of 1969, and previous court decisions. Furthermore, recent Federal Regulations, on the *quality* of storm water runoff created under the Clean Water Act, dictate the need to address this issue during the permit process. The Department's legal authority to control drainage to its ROW is based on two sources:

Act 200 of 1969

According to Act 200 of 1969 and the applicable administrative rules (247.224, Rule 24f):

"Altered natural drainage shall not be permitted to flow onto the highway right-of-way unless special provisions are approved by the Department."

Rules 247.223 and 247.261 are also directly applicable.

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#### Michigan Case Law

Michigan Case Law with respect to the Disposal of Surface Waters indicates:

1. The owner of a lower or servient estate is obligated to receive surface water from the upper or dominant estate in its natural flow.
2. The owner of the lower or servient estate may not fill his lands in such a way as to retard natural flow of surface water or cause it to impound upon the upper owner's land.
3. The owner of the dominant estate has no right to divert, concentrate, or increase the velocity of the natural surface water. Public authorities do not have the right to divert surface water, which would in the natural state be dispersed over a large area; and to cast such in a concentrated form upon the lands of the abutting owner, while causing damage, without paying compensation. For additional information see Chapter 2 of the MDOT Drainage Manual.

#### Accepting Additional Drainage From Local Agencies

**MDOT is not legally responsible for accepting drainage from an abutting property to the trunkline right of way that historically drained elsewhere.** However, past policy and practice has allowed for accepting additional water from local agencies if the highway drainage system will not be adversely affected. Such acceptance must be outlined in an agreement between MDOT and the local agency that has jurisdiction over the drainage outside MDOT right of way. If an agreement exists, a copy of the agreement shall be submitted with the permit application.

#### Drainage Agreements

The Design Support Area's Governmental Coordination Engineer and Drainage Coordinator should be contacted to develop and coordinate drainage agreements. If the agreement stipulates MDOT will accept new storm water, and the storm water is transferred into another watershed not within the jurisdiction of the local agency, this scenario shall not be permitted. Additional information on agreements with local agencies may be found in Chapter 2 of MDOT's Drainage Manual.

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### General Information

MDOT does not have the authority to regulate land use changes outside of the state trunkline right of way. Nevertheless, land use changes *may* change the local area drainage characteristics, and it is important for MDOT to regulate any potential increase in the rate of flow, velocity, and water quality impacts that may occur when properties adjacent to trunkline highways are developed.

### Flow Volume

MDOT requires the identification of flow rate, so as not to overburden its existing storm water conveyance systems. MDOT's storm water conveyance systems are constructed with public monies and are not required to provide for the development of private lands, although they can be sized to address future development of lands under Federal Aid Policy Guides. Nevertheless, *the flow rate should be restricted to existing flow rates*. Any increase in the flow rate may impact the highway or adjacent properties outside of State trunkline right of way.

### Land Use Changes

Local agencies approve all changes in land use. Sometimes the planned development of parcels adjacent to MDOT ROW indicates additional drainage area is proposed for MDOT's storm water conveyance system. When a change in the topography results in additional flow to the ROW, it is inherent that the developer receives approval from the local municipalities and/or the County Drain Commissioners when the parcel is located within an established county drainage district. MDOT is not encumbered to receive this additional flow. That is why MDOT restricts the allowable flow, via our permit process, to the existing established flow rate.

### Water Transfer Authority

MDOT does not have the authority to assist an applicant to transfer storm water from one watershed or drainage district to another via MDOT's storm water conveyance systems. Potential alterations of an established county drainage district boundary, or a consolidation of two or more established county drainage districts may be accomplished with a petition to the County Drainage Commissioner. This process falls under Section 433 of the Drain Code and involves the developer and the County Drain Commissioner. See chapter 2 of the MDOT Drainage Manual for additional comments regarding MDOT's legal responsibility.

### Ditch Closures

Burying a culvert may be permitted in order to close a ditch. However, any longitudinally placed culvert system of sufficient length that requires a manhole is defined as a longitudinal sewer system.

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#### Longitudinal Sewer Systems

Permits for longitudinal sewer construction within MDOT right of way shall only be issued to drain commissioners, drainage boards, and other governmental agencies upon approval by the MDOT Drainage Coordinator. In all cases, the local governmental agency should attempt to secure its own right of way or easements for its systems.

Construction by individuals or companies *may* be considered when the permit application is accompanied by a governmental resolution whereby the sewer, when constructed, will be the responsibility of, and be maintained by that governmental agency. Absent any governmental agency involvement, a longitudinal sewer constructed by a private party shall require an airspace agreement.

#### Sewer Taps

Permits for sewer taps and crossings *may* be issued to private individuals and companies as well as to governmental agencies.

#### Shared Conveyance System

Where a governmental agency has a prior written agreement with MDOT for use of a portion of the capacity in a department storm water conveyance system, other parties *may* be allowed to utilize a portion of that capacity. Such use shall require a department permit be issued for the connection into the storm water conveyance system. The permit conditions shall stipulate that the capacity utilized is attributed to the governmental agency. Such connection is subject to the restrictions outlined in the agreement with the local agency and is subject to local agency approval.

#### Commercial Developments Zoned Residential

Sometimes a commercial enterprise is undertaken on property zoned residential. Applications received from commercial and residential applicants, and where a change in the drainage character affects **less than (2) two acres**, *may* forego an engineered drainage design. If the permit applicant chooses to forego a formal engineering design, the use of form 2484 is not required.

Retention/detention basins are required and should be designed according to the following specifications. 8000 cubic feet should be retained for each acre of drainage area changed. The height dimension for open basins should not exceed 2 feet. No freeboard is required. A 4-inch pipe outlet should be installed with a positive grade into MDOT ROW, and with energy dissipation installed according MDOT's standard plans. Alternatively, applicants are entitled to employ a professional engineer and submit a certified design with the permit application.

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## **Permit Requirements**

Form 2205	Permit applications shall be made with form 2205 and shall include plans and specifications covering the proposed work.
Form 2484	This information shall be certified by completing the <u>Drainage Design Checklist for Accessing State Trunklines, Form 2484</u> . Form 2484 shall be filled in completely, and a professional engineering seal and signature shall be provided in the space provided.
Certification	<p>It is <u>not</u> the responsibility of MDOT to determine the storage volume required on an applicant's property. Rather, the applicant's engineer shall certify to MDOT that the storm water detention system has the capacity to function over the range of design flow rates, and that the storage volume needed <u>is contained on the applicant's property</u> for the full range of flows. The applicant's engineer shall certify the following information by completing form 2484:</p> <ol style="list-style-type: none"> <li>1. The proposed outlet control from the proposed drainage system is discharged at a flow rate equal to or less than the existing flow rate conditions into the MDOT storm water conveyance system;</li> <li>2. The velocity of the discharge is properly dissipated;</li> <li>3. There exists sufficient storage on the permit applicant's property for all the range of flows required to be analyzed, so that <u>no</u> harmful interference to MDOT ROW or adjacent properties will be caused as a result of utilizing the proposed storm water conveyance system.</li> </ol>
Permits Requiring Public Detention Systems	Public drainage easements are provided to public entities by private property owners to allow for the operation and maintenance of public storm water conveyance and detention systems. If the proposed detention system is to be located in a public easement area, the applicant shall provide evidence that such an easement exists for the proposed drainage system.
As Built Plans	Once constructed, the applicant shall provide either; as-built plans signed by a registered Professional Engineer in Michigan prior to the permit being closed; or a letter indicating <u>no</u> significant changes from the plans were made in the field.

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### **Design Parameters**

The following design parameters summarize MDOT's design fundamentals for MDOT storm water conveyance systems. Details on hydrologic and hydraulic methods can be found in the MDOT Drainage Manual.

A hydraulic study, drainage design, and calculations shall be prepared by a Michigan registered professional engineer to determine any adverse effect on the existing upstream and downstream drainage systems. The possibility that other adjacent property owners may request similar uses of the same storm water conveyance system should be considered. The existing storm water runoff, proposed storm water runoff, and required detention volume shall be determined and submitted with the permit application.

Flow Restricted to  
Existing Conditions

MDOT storm water conveyance systems are designed for the state highways they serve. Allowances are made during design to accommodate the surface drainage sloping naturally towards the roadway in the existing condition of imperviousness experienced at the time of design.

When an abutting property which historically drained to the state highway system undergoes a change in imperviousness (land use), any increased flow shall be restricted to the rate that existed at the time the MDOT drainage system was constructed. The proposed design shall not cause a harmful interference to the state trunkline or adjacent properties. "Harmful interference" is defined in the MDOT Drainage Manual as:

"Causing an unnaturally high stage or unnatural direction of flow on a river or stream that causes, or may cause, damage to property, a threat to life, a threat of personal injury, or a threat to water resources."

To show that the applicant is not causing harmful interference to MDOT ROW or other adjacent property, a map of the proposed contours for the applicant's property must be provided with the permit application. The limits of flooding for the 1% (100-year) flood frequency must be delineated on this contour map.

Hydrologic Analyses

Accepted methods for estimating peak flows are provided in Chapter 3 of the MDOT Drainage Manual. At a minimum, flow estimates shall be provided for the 10%, 2%, and 1% (10-year, 50-year, and 100-year) flood frequencies.



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#### Detention Requirements

The applicant *may* be required to provide a retention/detention system. The outlet control structure of this system shall control the flow to the existing flow rate condition for the full range of flows. The range of flow rates from the detention system's outlet control structure must be based on appropriate hydraulic equations for the range of head and flow conditions. The outlet control structure *may* be either an outlet pipe, a weir, a pump, or a combination of these types of control structures. An elevation (head) vs. discharge table or curve must be provided for the detention system.

#### Routing

The inflow hydrographs from the proposed land use change area are to be routed through the proposed detention system. Proper routing must be done to determine the required storage volume that will be constructed on the applicant's property. Recognized routing methods and computer applications include, but are not limited to: NRCS TR55; TR20; HEC-1; Storage Indication; and the Rational Method (using Triangular Hydrograph). An elevation vs. storage table or curve must be provided for the hydrologic route.

#### Energy Dissipation

The applicant may concentrate the flow from their property before it enters MDOT ROW, as long as proper adequate dissipation is provided. The maximum allowable velocity is 12 feet per second for an enclosed storm sewer and 6 feet per second for an open channel.

#### Water Quality

If development (change in land use) on a property has the potential to cause a hazardous material spillage or otherwise not meet established water quality standards, the proposed structure regulating flow to MDOT right of way shall be designed to ensure that the flow can be controlled if necessary. Commercial or industrial facilities include, but are not limited to:

- Car Washes
- Gas Stations
- Industrial sites with exposure to hazardous materials.

Where applicable, the applicant shall provide a copy of the application to the Michigan Department of Environmental Quality (DEQ) for a NPDES Industrial Storm Water permit.



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## Local Agency Requirements

MDOT recognizes that an applicant *may* be required to size a detention/retention basin based on local ordinances or requirements. A copy of the local ordinance or requirement, and calculations shall be included in the engineer's design calculations and sent to MDOT for comparison purposes. MDOT shall check the outflow characteristics of the control structure under various design flows, and the applicant's engineer shall provide the appropriate routing of these flows. The applicant's design must meet both the MDOT and local agency requirements.

The diameter of the outlet pipe shall remain constant across the right of way line according to the permitted pipe size. A manhole and orifice shall be permitted within state trunkline right of way -only if a local agency rule or ordinance requires a minimum pipe size greater than MDOT's permitted pipe size.

## References

Administrative Rules Regulating Driveways, Banners and Parades On and Over Highways, Effective June 30, 1970, Michigan Department of Transportation, Second Reprint, February, 1990.

Drainage Manual, Michigan Department of Transportation, Design Support Area.

This manual can be found at the following address:

<http://www.mdot.state.mi.us/stormwater>

Click on Drainage Manual

Michigan Department of Transportation Real Estate Support Area Utility Coordination and Permits Section Construction Permit Manual	<div style="text-align: right;">14.02</div> <div style="text-align: center;"> <b>DRAINAGE DESIGN CHECKLIST FOR ACCESSING STATE TRUNKLINES</b> </div> <div style="display: flex; justify-content: space-between;"> <span>January 14, 1999</span> <span>Page 1 of 2</span> </div>
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### **Purpose**

This guide should help MDOT Utility Permit Engineers review proposals and help each applicant's engineer submit drainage design information. MDOT's Road Design Manual, Chapter 4 on Drainage, should be used as the primary reference for hydrologic and hydraulic calculations.

### **Required Information**

- ☐ Plans of proposed storm water conveyance system
- ☐ Outlet control details
- ☐ Energy dissipation for water quality purposes
- ☐ Connection details to MDOT system
- ☐ Outlet shut off details for water quality purposes
- ☐ Hydrologic and hydraulic design calculations
- ☐ Certification signed by a Michigan Registered Professional Engineer

### **Flood Routing Method**

Select one:

- ☐ NRCS TR55 Graphical
- ☐ NRCS TR55 Tabular
- ☐ TR20
- ☐ Rational Method (Triangular Hydrograph)
- ☐ HEC-1
- ☐ Other (specify)

Please provide input and output printouts for all range of flows when computer applications are used.

### **Local Agency Storm Water Ordinance Requirements**

Since many local agency requirements for either flow or storage volume can be more restrictive than MDOT's requirements, please include local agency requirements in the design calculations.

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### Data Summary

Q = Discharge, V = Velocity, and Vol. = Runoff Volume

Required storage volume is the difference between proposed and existing conditions.

	Existing			Proposed			Proposed Outflow		Required Storage Vol.
	Q	V	Vol.	Q.	V.	Vol.	Q	V	
Frequency									
10-year									
50-year									
100-year									
Drainage Area									
Design Storage Volume									

### Certification

I \_\_\_\_\_, P.E., have prepared the attached plans and specifications for the proposed drainage system. The proposed outlet control from this drainage system is discharged at a flow rate equal to or less than the existing flow rate conditions into the MDOT storm water conveyance system, the velocity discharged is properly dissipated, and the designed storage volume is adequate for the appropriate frequency listed above. The design is based on the attached hydrologic and hydraulic calculations which are summarized above.

\_\_\_\_\_, P.E.

Michigan Professional Engineer License Number \_\_\_\_\_

